

Documents

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Experimental investigation of three different tube equal channel angular pressing techniques

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Abstract

Three methods to fabricate ultra fine grain tube shaped specimens have been proposed and tested using conventional equal channel angular pressing (ECAP) die with the channel angle of 90°. Commercial pure copper tubes have been put through up to three passes via route C. Sand (S-ECAP), rubber (R-ECAP) and grease (G-ECAP) were used as a mandrel to maintain tubularity of samples during deformation processes. Hardness values and thickness variations of the deformed tubes were measured and compared for the above three techniques. To confirm the reduction of grain size, the microstructures of the copper tube before and after equal channel angular pressing were also examined using optical and scanning electron microscopy. The results imply that although all three tube production methods lead to the improvement of hardness magnitudes, R-ECAPed and G-ECAPed tube samples give higher hardness magnitude and better hardness distribution uniformity, respectively. Furthermore, the outcomes denote that R-ECAP gives the least tube wall thickness changes as compared to S-ECAP and G-ECAP processes.

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